Case report

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Calcified brain metastatic adenocarcinoma: A case report and review of the literature

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Abstract

Introduction: Calcification in brain metastasis occurs rarely so it is reported in approximately 1% of surgical and 6.6% of autopsy specimens. Here we report a new case of brain metastasis with calcification.

Case presentation: A 44-year-old woman presented with a generalized tonic–clonic seizure with no neurological deficit on physical examination. Brain imaging demonstrated a hyperdense lesion on computed tomography scan and hyposignal and rim enhancement on T1, T2 and T1 with gadolinium injection sequence images in the right parieto-occipital lobe. Intraoperatively, there was a well-defined solid homogenous calcified mass within brain parenchyma. The lesion that resembled a meningioma was totally resected. The histopathological examination revealed metastatic adenocarcinoma.

Conclusion: Metastatic brain lesions should be in the differential diagnosis of a solitary calcified brain mass, although it occurs rarely. It is important to differentiate it radiologically from intralesional haemorrhage.

Keywords

Calcified brain mass, metastatic adenocarcinoma, colon cancer

Introduction

Calcification is a physiological process in the brain and also in the choroid plexus and pineal gland. As a pathological process, it occurs in vascular, neoplastic, inflammatory and metabolic diseases.[1] Brain tumours such as meningioma and oligodendroglioma, infectious processes such as tuberculosis, fungal and cysticercosis and metabolic diseases such as hyperparathyroidism are the most common clinical situations associated with an intracranial calcified mass.[2] Calcification in brain metastasis occurs rarely so it is reported in approximately 1.1% of surgical and 6.6% of autopsy specimens.[3] Here we report a new case of brain metastasis with calcification.

Case presentation

A 44-year-old woman presented with a generalized tonic–clonic seizure 3 days before the admission. Physical examination showed no neurological deficit. Brain computed tomography (CT) scan demonstrated a hyperdense lesion in the right parieto-occipital lobe (Figure 1). Brain magnetic resonance imaging (MRI) demonstrated a well-defined lesion in the right parieto-occipital lobe that was hyposignal on T1 and T2 associated with rim enhancement on T1 with gadolinium injection sequence images (Figure 2). There was moderate vasogenic oedema around the lesion. Laboratory tests and chest X-ray were normal.

After right parietooccipital craniotomy, opening the dura by the transcortical approach, there was a well-defined solid homogenous calcified mass within the brain parenchyma. The lesion that resembled a meningioma was totally resected. The histopathological examination revealed metastatic adenocarcinoma, most probably from the colon region. The patient was referred to an oncologist for further work-up and treatment. After scalp wound healing, the patient received adjuvant cranial radiotherapy for local control of the disease. After a thorough work-up, the large intestine tumour (caecal adenocarcinoma) was affirmed, and she underwent systemic chemotherapy for treatment. At the last follow-up 4 months after surgery, she had completed the adjuvant radiotherapy and was receiving systemic chemotherapy, she had no neurological signs and symptoms and no evidence of recurrence on brain imaging.

Discussion

Metastatic brain lesions can be solitary or multiple. On CT scan, they can be hypo, iso or hyperdense

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compared to the adjacent brain parenchyma. However, in the setting of metastatic brain melanoma and intralesional haemorrhage, CT scan demonstrated a hyperdense lesion.[4]

Haemorrhage into the metastasis can make the diagnosis of calcified mass challenging. Some attention helps to differentiate them from each other. First, attenuation values for haemorrhage are usually 35–55 Hounsfield units, but two studies demonstrated Hounsfield units of 50–105 and 86 for calcification within metastasis.[5] Second, it is more likely that punctuate and curvilinear hyperdensity is metastasis, but differentiation in the setting of amorphous hyperdensity is difficult. Third, calcification is usually unchanged or progresses very slowly during follow-up, but haemorrhage-induced hyperdensity resolves over time.[5]

Brain metastasis does not generally calcify. When a metastasis shows calcification other diagnoses should be considered.[4]

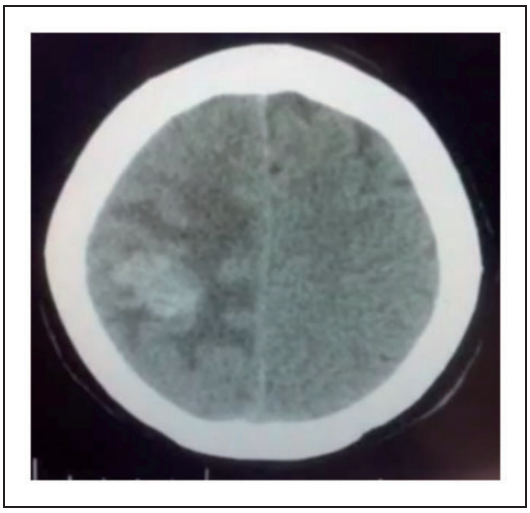

Figure 1. The axial brain computed tomography scan shows a hyperdense mass with surrounding hypodensity.

Intracranial calcification can be physiological as occurs in the basal ganglia and cerebellum due to the rich source of endogenous iron and calcium,[2] or can be associated with the pathological process as a slowly progressive glioma; and in infectious diseases such as tuberculosis, fungal infection and cysticercosis; and occasionally, with cystic lesions due to the slowing process of calcium deposition.[6] Although the exact mechanism of calcification into metastatic lesions is unknown, there are two theories: first, degenerative and necrotic tissue decreases metabolism, resulting in disruption of carbon dioxide production, ultimately making the lesion alkaline compared to the surrounding parenchyma, consequently facilitating the deposition of calcium in alkaline tissue. Second, necrotic and degenerative tissue has a low level of oxygen that results in the influx of calcium into the intracellular space and a high level of alkaline phosphatase resulting in calcium phosphate deposition.[2]

Because calcification usually occurs in the necrotic part of the lesion, significant enhancement does not occur in this part so the peripheral non-necrotic part only shows marked enhancement.[5]

The most common intracranial masses with calcification includes oligodendroglioma, low-grade astrocytoma, craniopharyngioma, meningioma, pineal gland tumours and ependimoma.[6]

Although lung, breast, colon and ovaries are the most common primary site of cancer resulting in calcified brain metastasis, however, cases have been reported of calcified brain metastasis with an origin of squamous cell carcinoma and adenocarcinoma of the lung, sarcoma of the mediastinum, squamous cell carcinoma of the cervix, adenocarcinoma of the pancreas and non-Hodgkin's lymphoma.[2]

In the present case, the brain lesion was a solitary mass, hyperdense on CT scan associated with vasogenic oedema. Intralesional haemorrhage was the most differential diagnosis versus calcification. With the help of

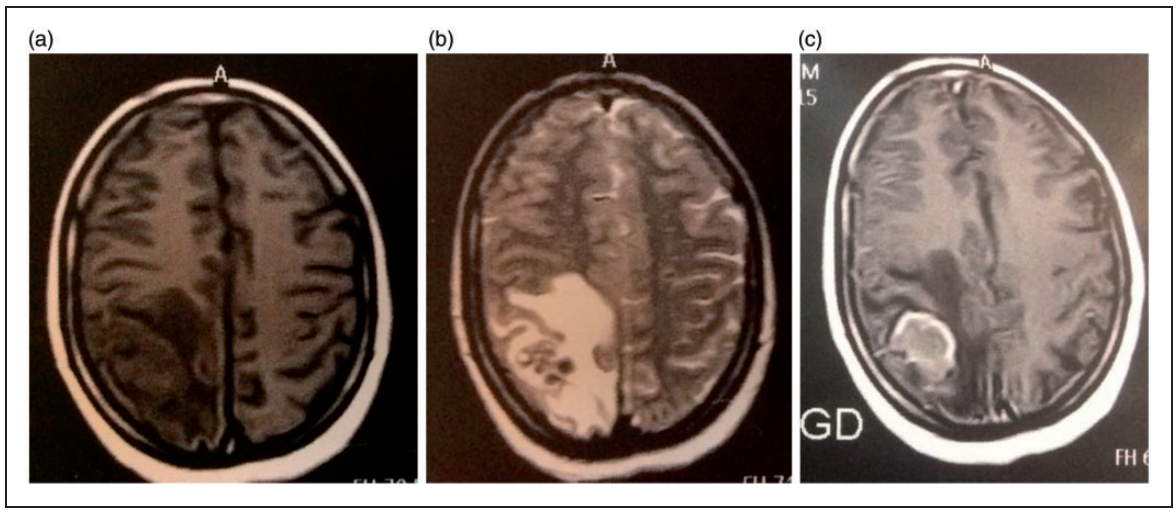

Figure 2. (a) Axial T1; (b) axial T2; and (c) T1 with gadolinium demonstrates the intra-axial lesion.

Table 1. Previous studies reporting cases of calcified brain metastasis.

Row	Study	Age	Sex	Previous malignancy	Features of calcification	Location	Number of lesions	Procedure	Outcome/ follow-up duration	Confirm after	Histopathology
1	Callizo et al.[7]	61	M	–	Punctate/curvilinear comma-like scattered	Disseminate	Multiple	–	–	Autopsy	Acinar cell carcinoma of the pancreas
2	Ricke et al.[1]	52	F	Ovarian cancer	Circular/ irregular	Disseminate	Multiple	Biopsy	–	Histopathology	Papillary carcinoma of the ovaries
3	Fukuda et al.[8]	60	F	Lung adenocarcinoma	Nodular	Disseminate	Multiple	–	–	Autopsy	Papillary adenocarcinoma lung
4	Gaze et al.[9]	32	w	Squamous carcinoma of cervix	Punctate	Temporoparietal	Solitary	Surgery	Death/10 months	Histopathology	Squamous carcinoma of cervix
5	Yamada and Suzuki[10]	55	M	Diffuse, large cell non-Hodgkin's lymphoma	Nodular	Thalamic region	Solitary	–	Survived/12 months	–	–
6	Tashiro et al.[3]	57	F	–	Conglomerate	Corpus callosum	Solitary	Surgery	Death/12 months	Histopathology	Metastatic squamous cell carcinoma/ unknown origin
7	Tomita and Larsen[11]	4.5	M	Undifferentiated sarcoma	–	Parietal/ cerebellum	Two lesiosn	Surgery	–/3 Months	Histopathology	Metastatic undifferentiated sarcoma
8	Yamazaki et al.[12]	58	M	–	Scattered punctate	Disseminate	Multiple	Biopsy	Death/8 months	Histopathology	Metastatic adenocarcinoma of the lung
9	Ohmoto et al.[13]	29	M	–	–	Frontal lobe	Solitary	Surgery	Survived/2 years & 3 months	Histopathology	Adenocarcinoma of lung
		46	F	Lung cancer	Linear	Frontal lobe	Solitary	Surgery	Death/3 years & 3 months	Histopathology	Adenocarcinoma
10	Kawamura et al.[2]	33	F	Ovarian cancer	–	Cerebellar hemisphere	Solitary	Surgery		Histopathology	Serous mucinous adenocarcinoma
11	Bhatoe and Gill[14]	9	F	Non-Hodgkin's lymphoma	–	Frontal lobe	Solitary	Biopsy	Death/12 days	Histopathology	Non-Hodgkin's lymphoma
12	Inomata et al.[15]	68	F	Lung adenocarcinoma	Scattered	Disseminate	Multiple	–	Death/1 year	Autopsy	Lung adenocarcinoma/ leptomeningeal adenocarcinoma
13	Fatehi et al.[16]	30	M	Breast cancer	–	Disseminate	Multiple	–	–	–	–
14	Michail et al.[17]	60	F	Colorectal carcinoma	–	Frontoparietal	Solitary	Surgery	–	Histopathology	Adenocarcinoma of colorectal
15	Stadnik et al.[18]	70	F	–	Peripheral calcification	Post fossa	Multiple	Surgery	–	Histopathology	Papillary cystadenocarcinoma
16	Nakase et al.[19]	62	F	Small cell carcinoma of lung	–	Disseminate	Multiple	–	Death/1 year	Autopsy	Small cell carcinoma of lung

(continued)

Table 1. Continued

Row	Study	Age	Sex	Previous malignancy	Features of calcification	Location	Number of lesions	Procedure	Outcome/ follow-up duration	Confirm after	Histopathology
17	Eom and Kim[6]	50	F	Lung cancer	–	Frontal lobe	solitary	Surgery	–	Histopathology	Non-small cell carcinoma of lung
18	Hwang et al.[20]	62	M	–	–	Parietal/temporal/ corpus callosum	Three lesions	Surgery	Death/2 years & 9 months	Histopathology	Metastatic adenocarcinoma
		50	M	Squamous cell carcinoma of the lung	–	Temporal lobe	Solitary	Surgery	Death/1 year	Histopathology	Squamous cell carcinoma of the lung
19	Teksam et al.[21]	21	M	Osteosarcoma	–	Tepmoroparieto-occipital	Solitary	Surgery	Death/20 days	Histopathology	Calcified metastasis of osteosarcoma
20	Anand and Potts[5]	38 to 72	5F/ 2 M	Lung, breast	Punctate	Temporal lobe	Solitary	–	–	–	–
				Lung	Punctate	Supra/infra-tentorial	Multiple	–	–	–	–
				Oesophagus	Curvilinear	Cerebellum	Solitary	–	–	–	–
				Lung	Curvilinear	Cerebellum	Solitary	–	–	–	–
				Colon	Amorphous	Frontal lobe	Solitary	–	–	–	–
				Breast	Punctate	Supratentorial	Multiple	–	–	–	–
				Colon	Amorphous	Frontoparietal	Solitary	–	–	–	–
21	Fernandez et al.[22]	48	M	Osteosarcoma of mandible	Round	Centrum semiovale	Two	–	–	Death/few days	–
22	Our study	44	F	–	Amorphous	Parietal lobe	Solitary	Surgery	Under follow-up	Histopathology	Adenocarcinoma, probably from colon origin

Hounsfield units on CT scan (60 Hounsfield units) and MRI findings, the first diagnosis was a metastatic calcified mass confirmed intraoperatively. Considering the intraoperative observation, intraparenchymal meningioma was the most important differential diagnosis (due to shape, consistency and calcification of tumour). Ultimately, histopathological examination confirmed the diagnosis of metastatic adenocarcinoma. A thorough follow-up demonstrated that the caecum of the large intestine was the origin site of the tumour without additional dissemination of the primary lesion except for brain involvement. A retrograde history demonstrated that the patient had no gastrointestinal symptoms, and the brain lesion-related symptoms were the presenting symptoms of her cancer. After a 4-month follow-up, the patient was neurologically stable with no brain recurrence, while she was undergoing systemic chemotherapy. Table 1 demonstrates the most important studies, reporting cases of calcified brain metastasis.

Conclusion

Metastatic brain lesion should be in the differential diagnosis of a solitary calcified brain mass, although it occurs rarely. It is important to differentiate it radiologically from an intralesional haemorrhage.

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Conflict of interest

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